

from zero ($n=344$, $P=0.029$); i.e., surface net B was consistent in catching more eggs than surface net A even though the total seasonal difference between nets was only 217 eggs.

A similar comparison of oblique net egg collections indicated no significant difference in egg counts between paired nets. A total of 2,297 eggs ($n = 339$; mean = 6.80; S.D. = 20.66) was collected in oblique net A, and 2,810 eggs ($n = 339$; mean = 8.13; S.D. = 30.91) in oblique net B. Again, analysis indicated that the data were skewed and not normally distributed. The data were transformed using the natural log, and a signed rank test revealed that differences in catch between the two nets were not significantly different from zero ($n=339$, $P=0.479$).

In 1989 egg collections in surface nets and oblique nets were not significantly different. A natural log transformation on average surface net data and average oblique net data showed that differences between egg counts with depth were not significantly different from zero ($n=339$, $P=0.082$).

A comparison of egg viability estimates between surface net samples and oblique net samples indicated no significant difference in egg viability with depth ($n=92$, $P=0.864$).

Egg production estimates on a per trip basis were calculated for surface samples, oblique samples, and all samples combined. When spawning activity was low, differences in egg production estimated as a function of depth appeared large (Table 9). For example, on 3 May 1989 no eggs were collected in surface nets and therefore no egg production was estimated for that day using Hassler's method. However, egg production estimated from oblique samples for the same day resulted in a total of 20,225 for the six trips, or 1,003,728 eggs for the 24-hour period (Table 10). When spawning activity intensified later in the season, these differences in estimates were relatively smaller and not significantly different statistically.

The two methods of calculating daily egg production (Table 10) -- the Hassler method and the Trip method -- were compared statistically for surface samples, oblique samples, and all samples combined. For surface samples, Hassler's method yielded a 1989 egg production estimate of 637,919,161 (S.D. 27,078,836), and the Trip method estimated a seasonal total of 637,110,340 (S.D. 27,668,383). Analysis (sign rank test) on natural log transformed data indicated no significant difference ($n=61$, $P=0.690$) in the two methods. For oblique samples, the Hassler method estimated a total egg production of 720,331,787 (S.D. 31,057,829), while the Trip method estimated 720,161,682 (S.D. 31,057,571), again not statistically different ($n=61$, $P=0.604$, log transformed data). Using all data collected by both surface and oblique nets, egg production estimates by the two methods were not significantly different ($n=61$, $P=0.580$, log transformed data).

Discussion

Water Temperature, River Flow, and Spawning

The tendency for a fish species to be successful and thrive is ultimately determined by the ability of the individuals in the population to reproduce successfully in a fluctuating environment, thereby maintaining a viable population. Each fish species thrives under a unique set of ecological conditions, so the reproductive strategy is also unique with special anatomical, behavioral, physiological, and energetic adaptations (Moyle and Cech 1982).

The role of temperature as an environmental cue for fish reproduction is well documented. Seasonal changes in temperature and light are often the most important cues physiologically because they can act directly or indirectly on hormonal glands to control development of the gonads (Moyle and Cech 1982). The onset of striped bass spawning occurs later in the season with increasing latitude, starting in February (Florida) and continuing through June or July along